The Carolina Engineer

SCHOOL OF ENGINEERING
University of North Carolina

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VOLUME II, NUMBER 3

MAY, 1934

G-E *Campus News*

STREAMLINED MOTOR

The new automobiles and airplanes have nothing, as far as streamlining goes, on an electric motor recently manufactured by General Electric. And undoubtedly many visitors to Langley Field, in Virginia, where the motor is now located, will think it some kind of miniature "Zeppelin." The motor is being used in investigations of the noises made by various types of propellers, the objective, of course, being to design a propeller in which noise is reduced to the practical minimum.

The motor, of the wound-rotor induction type, rated at 200 horsepower, is probably the first of its kind ever built. The propellers are mounted directly on the motor shaft, and can be run at speeds of between 1000 and 3600 rpm. The noises are picked up by a microphone and analyzed by means of special measuring devices.

The motor was designed by C. J. Koch, M.I.T., '24, and M. H. Wells, Syracuse, '02; and the control by A. Suksdorf, Washington State, '16.

LESS NOISE

Until recently, noise has been regarded as a necessary evil, something that has come quite naturally with higher speeds and more complex civilization. But someone noticed that noise gives us the "jitters": rubber tires began to appear on milk wagons, and rubber cushions on ash cans. So, when General Electric was developing its air-conditioning units, noise became an important factor. Propeller-type fans, which had to run 24 hours a day to circulate air, were used, and they made too much noise for comfort. The Research Laboratory was given the job of doing something about it.

Research scientists examined the blades and found that on conventional fans all parts of the blade did not push air at the same rate of speed: in some cases, in fact, some parts pulled air back instead of pushing it forward. Blades on which every bit of surface pushed air at approximately the same speed were designed. And lo! not only was the efficiency of the fan tremendously increased, but the fan was quiet. Furthermore, a system was evolved whereby accurate fan-noise rating is possible. As a result, air-conditioning units which make no more noise than is present in a closed room on a quiet day were developed.

This quiet-fan development was done under the direction of K. D. McMahan, Oklahoma A. & M., '29, of the G-E Research Laboratory.

CHARLES PROTEUS STEINMETZ

"Guide, philosopher, and friend" to his generation of electrical engineers, he would have been 69 years old had he lived until April 9. From his 30 years of work with General Electric came the mathematical formulas involving alternating current, the discovery of the laws of hysteresis, and methods of protecting transmission lines from lightning damage.

These, to name a few, were basic aids in establishing present-day standards of electric service.

Yet, the heritage left by Steinmetz is the memory of not only a great scientist but of an essentially charming, kindly, helpful man of wide interests.

Out of the past, on the night of April 7, his voice spoke to radio's thousands—a voice that lives on a strip of film, evidence of our victory over time. Thus was inaugurated a three-day tribute to one who was loved for his human qualities as well as revered for his engineering achievements.

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NRA MEMBER U.S. WE DO OUR PART

GENERAL ELECTRIC

THE CAROLINA ENGINEER

The Professional Journal of the School of Engineering

UNIVERSITY OF NORTH CAROLINA

VOLUME II MAY, 1934 NUMBER 3

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E·D·I·T·O·R·I·A·L

OUR FIRST

This issue of the *Carolina Engineer* officially launches the new staff. We start out with the hope of maintaining, and where possible improving, the high standards set by our predecessors, who have so successfully carried on the spirit and ideal on which the publication was founded.

It has been the purpose of the staff to devote most of this issue to the school itself. This, it is, felt, will both interest and benefit the students by acquainting them with many things about the school which they are not sufficiently familiar. The staff believes that such an issue, besides stimulating an increased interest in the magazine, will help to create a sense of unity among the students and a consciousness that all engineering students are members of a profession with a code of ethics which it is their duty to maintain.

INTEREST IN PROFESSIONAL SOCIETIES

Many of our students are constantly complaining of being taught too much theory and of receiving very little practical knowledge. Yet, these same students do not attend the meetings of their respective student professional societies where practical engineering problems are presented and discussed. Such students fail to see the connecting link between the engineering school and the professional world.

These chapters keep before the student the achievements of practicing engineers, and the problems they have met with and overcome. Since knowledge of the fundamentals of engineering is essential to a successful engineering career, the engineering schools spend most of the four short years instilling the students with such elements. Consequently, the student has little time to learn of the practical side of engineering except through his student chapter. By means of illustrated lectures and talks from practicing engineers, the chapters bring the student in contact with important engineering work. The societies develop a strong respect for the profession and inculcate the ethics by which the profession exists. Materially membership in the societies is advantageous. The national professional societies usually accept into their organizations engineering graduates who have been active in their student chapters. Whereas, often several years of experience must be had before the applicant is successful in gaining admission. However, the chief advantage of the student chapter is gained from participating in its activities. Every efficient chapter is highly organized and has its officers and committees. Serving in these groups develops in the student a sense of cooperation and responsibility.

A COMBINED INSPECTION TRIP

Instead of each group of seniors taking an inspection trip, a combined trip with the seniors of all the branches of engineering going together would be much more economical. By having a large group traveling together, transportation per person would be much cheaper and special rates could be obtained for meals and lodging. All of the Seniors take some courses together and with groups of these men away at different times these courses are disrupted over a period of several weeks. This could be avoided by making trips as a single group. Also with a large number, a definite date could be planned ahead of time and it would not be necessary to postpone the trip each time one or two decided that they had something else to do on that particular date.

Such a trip should probably take a week. The group could visit several industrial centers and obtain a much better understanding of what is being studied in class. Particularly since the cooperative work has been suspended here inspection trips afford many Seniors the only opportunity to see engineering in practice and to get a good conception of what class diagrams and blueprints represent.

CONGRATULATIONS

With the realization that it has suffered a distinct loss, the School of Engineering congratulates Neil P. Bailey on his recent appointment as Head of Mechanical Engineering at Iowa State. No member of the faculty has been any more deserving of advancement than Professor Bailey. Always a hard worker he has constantly strived to maintain and raise the standards of the school. In turn he is held in the highest esteem by both students and faculty. Students have a keen instinct in judging professors; without reservation, it is the general impression that Professor Bailey is capable of teaching any course in the engineering curriculum and of teaching it well. Aside from his remarkable ability all who have come in contact with him admire and respect him as a man and a true friend who has always had the interest of the school and students at heart. His place will be hard to fill. Congratulations! Iowa State.

THE CAROLINA ENGINEER

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History of the School of Engineering

By W. C. Morrison

Although the University of North Carolina has only had a separate school of engineering since June, 1922, courses in engineering of professional grade have been given here since the opening of the school in 1795. In fact, the first student of the University, Hinton James successfully practiced engineering after his graduation, and some of the construction and works in which he took part are still to be seen in the eastern part of the state. Before the present engineering building, Phillips Hall was constructed, the various subjects in the engineering curriculum were taught in the other buildings on the campus. Some of our older professors can remember the time when mathematics was taught in the Old East building and drawing in the basement of the Alumni Building.

In 1867 with the passage of the Morrill Act for land-grant colleges, this University received this state's land-scrip rights. However, since this school did not carry out the practical plan of establishing a college of agriculture and mechanical arts, and also as a result of the agitation by the agricultural and industrial interests in the state, the University was forced in 1887 to relinquish the rights in favor of a new institution which was later to be built in Raleigh.

Up until 1890, the courses in engineering were only incidental subjects counting as credit towards an A.B. degree. However, in that year, the first definite curriculum in engineering was established in the Department of Engineering and Mathematics. Fourteen years later this department was expanded into the department of Applied Science which in turn four years later expanded into a distinct school of Applied Science. This condition existed up until 1922 when the Board of Trustees of the University decided to form a separate School of Engineering in no way connected to the School of Applied Science. This decision was greatly influenced by the rapid development of the profession of engineering and with the great need of well trained professional engineers especially in this state.

The present school shows the influence of the Harvard School of Engineering both in its curriculum and method of teaching. A large part of the leading professors are themselves graduates of that school. In connection with the above program of instruction, a modified form of cooperative education was also introduced. This plan contains the outstanding feature of cooperative work as has been developed by such large and well-known institutions as the University of Cincinnati, the University of Pittsburgh, and the Massachusetts Institute of Technology.

The present school includes four main departments, the divisions of Civil, Electrical, Mechanical and Chemical Engineering. Under the Mechanical Engineering curriculum, the student may elect an aeronautical option in his senior year. These above departments, since their establishment have prepared the student for the professional branches of engineering with less emphasis being placed on the technical and executive work in specific industries.

The cooperative system of education which runs along parallel to the above curriculum has since its establishment in September, 1922 been shown to be very successful. All members of the junior class under this plan except those in the Chemical Engineering division spend part of their time working on actual engineering work, and the remainder of the time in the regular school work. This is accomplished by dividing the students into two sections called Sections I and II. The student in Section I has an alternate in Section II so that when the former is at school, the latter is on the job. Positions are then interchanged at regular intervals of time thus affording each student the same amount of time on his outside work. At the beginning of the student's senior year, all students return to school and attend the University full time. To compensate for the time the student is away from school, subjects are taught in summer school so that the full amount of school work is obtained. This plan is immensely profitable in that it gives the student practical experience on real engineering work and also gives him the chance to earn a little money. Up until 1931 this plan was very successful in its operation, but because of the poor business conditions at that time, it was deemed advisable to discontinue the plan until cooperative positions of acceptable quality could be obtained for the students. However when business conditions improve in the future, the cooperative plan will be resumed.

On June 20, 1931, Governor O. Max Gardner appointed a committee whose purpose was to in-

vestigate a proposal of a practical plan of consolidation and unification of the University of North Carolina, the North Carolina State College of Agriculture and Engineering, and the North Carolina College for Women. This committee made its report in July, 1932, and recommended the following program for the two schools of engineering at Chapel Hill and Raleigh. It first suggested that the engineering school at Raleigh consisting of the four general engineering divisions should be removed from Raleigh to Chapel Hill. This was to be accomplished as soon as adequate laboratory and dormitory accommodations could be provided for at Chapel Hill. If this consolidation took place, it would give the University at Chapel Hill unusually effective faculties for the instruction of professional engineering courses. As the cooperative plan enables the student to obtain experience in practical work, less time would need be spent in machine and wood shops for instruction in the industrial operations. This would thus enable more time to be given for the instruction of the student in the other cultural and professional courses which are so necessary in a balanced professional engineering curriculum. Included in this plan was also a proposal for the construction of a new engineering unit at Chapel Hill at an estimated outlay of from $300,000 to $500,000 which would supply adequate classrooms and laboratory space for the combined enrollments. All these suggestions were made with the intention of continuing at Chapel Hill a school of engineering which would be known throughout the southeast as an institution well-equipped for the instruction of young men in the courses of professional engineering. This plan was deemed advisable to be put into effect as soon as possible but up until the present time little has been done about the matter. With our last consideration, we are now up to the present date with the hope that the engineering school will continue to improve its record and standards as the years go on.

FIRST OBSERVATORY

The University of North Carolina had the first astronomical observatory connected with an institution of learning in America. In 1830 President Caldwell, first president of the University, erected a building in which he could use some astronomical instruments bought by him in London. Most of these instruments are still in the possession of the physics department, although they are useless, since members of Sherman's army stole the lenses out of them during the Civil War.

An Interview with Dr. Harry A. Curtis

By JACK CRUTCHFIELD

It is a rare occasion when the University is able to entertain a scientist of such note as Dr. Harry A. Curtis, chief chemical engineer of the Tennessee Valley Authority. This man, who came here as principal speaker for Chemical Engineer's Day, is recognized as an international authority on nitrogen fixation, on fuels, and on engineering education. At various times in his career he has served as professor of chemistry at the University of Colorado and at Northwestern University, general manager of the Clinchfield Carbocoal Corporation, chief nitrogen survey of the U. S. Department of Commerce, head of the department of chemical engineering at Yale University, director of research of the Vacuum Oil Company, and as a member of President Coolidge's Muscle Shoals Commission. He is vice-president of the American Institute of Chemical Engineers.

Dr. Curtis possess an elert mind and an aggressive nature. However, his kindly and unassuming manner induce in those he meets a feeling of cordial friendship.

In an interview with the reporter for the *Carolina Engineer*, Dr. Curtis was asked to discuss the merits of a four and a five-year course in chemical engineering. He replied in substance:

"There is no doubt of the better training that can be obtained in a five-year course. In the past, the demand of industry for graduates has discouraged an extra year in school. Now, however, the demand has relaxed, and more men are turning to the fifth year. In the absence of a five-year undergraduate course, I believe it is well for a student to take one year of graduate work if he can spare the time and the money. One must consider, however, the inherent abilities of the student and whether graduate work will better fit him for the work he intends to do after college."

When he was asked his opinion about the addition of more cultural courses to the engineering curriculum, his answer was:

"Engineering courses are themselves cultural courses, and should be taught as such. It is certain that more varied courses will broaden the scope of a person's knowledge, and if the curriculum can be extended to five years, then additional courses in English, sociology, and economics are highly desirable. But with a four-year curriculum there is always a compromise between

(*Continued on page sixteen*)

An Investigation of the Failure of Cast Iron Pistons in an Automobile

By PAUL R. HAYES

EDITOR'S NOTE: *The following article in condensed form is a paper submitted by Mr. Hayes to the third Annual Southern Student Conference of the American Society of Mechanical Engineers and was awarded first prize.*

1. *Purpose.* The investigation herein reported was conducted in the mechanical engineering laboratory of the University of North Carolina for the express purpose of answering the question: "Why did three pistons in an automobile engine fail almost simultaneously after 34,000 miles of use?"

2. *Historical.* The circumstances leading up to the investigation are as follows: A professor of Civil Engineering at the University reported that after operating his 1927 model Nash Special Six 33,995 miles, a piston failed. He had the piston replaced and had driven only 255 miles farther when another piston failed. This piston, too, was replaced. However, additional travel of 260 miles was sufficient to break a third piston, so all six pistons were removed and replaced. The six used pistons were presented to the mechanical engineering department along with the previously mentioned question.

3. *Materials.* The material for use in obtaining data in this investigation consisted of one piston broken in service, two practically new replacement pistons, and three pistons that, from all indications, were on the verge of failure when removed from the engine.

The broken piston was in four pieces, the top being in three pieces and the rest of the piston being intact. The top of the piston had cleanly separated from the cylindrical portion at the top of the upper ring groove. The top itself was

FIGURE 1

divided into three pieces by cracks radiating from the center and normal to the plane of the top (see Fig. 1). According to the owner of the car, the other two pistons failed in a similar manner.

Comparison of measurements of new and old pistons showed that the new pistons had much more material back of the upper ring grooves than did the old pistons, and the tops of the new

FIGURE 2

pistons were made more rigid by supplying a rib beneath them. Except for the ribs and larger fillets on the new pistons, measurements pertinent to this problem were the same for all pistons.

4. *Calculations.* To get an accurate estimate of the maximum pressure to which the piston was subjected in normal use, the maximum b. hp. and corresponding r.p.m. were obtained from a curve supplied by the manufacturers. From these values the brake m.e.p. was calculated, and, assuming a mechanical efficiency of 65%, an approximate value of the indicated m.e.p. was obtained. Then by checking with indicator diagrams of engines having similar compression ratios, m.e.p.'s, and hp. output, it was estimated that the maximum normal operating pressure in the combustion chambers of the engine was about 400 lb. per sq. in.

In order to make the necessary stress calculations, it was assumed that the piston top is subjected to uniform pressure and acts as a circular plate with clamped edge. The general procedure of calculations outlined by Timoshenko and Lessells in their book *Applied Elasticity* was followed. The results of these calculations are shown in the curves of Fig. 4.

In solving the derived equations for the stresses in various sections of the top, the actual thickness of the top at each of these sections was used. The variation in thickness of the top accounts for the irregularity of the curves of Fig. 4.

Both new and old pistons have a "knob" of material beneath the center of the top which more than makes up for the lathe hole in the top (see Fig. 2). The thickest and therefore strongest

section of the top, then, is that within 5 16 in. of the center. At the very edge of the knob the top was found to be 1 8 in. thick, increasing gradually to a thickness of 5 32 in. at the inside edge of the top.

The calculations show that at the edge of the top, radial stress is about four times as great as

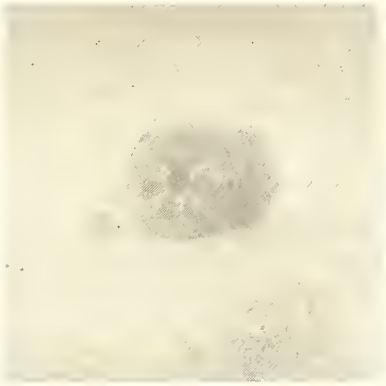


FIGURE 3

tangential stress, each stress is zero at some point between the edge and the center, and the stresses are equal at the center. The knob in the center of the top prevents the development in this section of the full unit stress indicated by the calculations. The dotted portions of the curves indicate the estimated variations of stress in this section. The curves show that both tangential and radial moments at the edge of the top are opposite in direction to the same moments at the center. In other words there is tension in the upper surface and compression in the bottom surface at the edge of the top, and compression in the upper surface and tension in the bottom surface at the center. Since cast iron is much weaker in tension than in compression or shear, it is to be expected that piston tops subjected to purely static pressure would fail in tension on the upper surface close to the edge support and in tension on the lower surface near the center.

5. *Test Apparatus.* In testing each of the unbroken pistons it was desired to apply a uniform pressure to the piston top while the piston was supported by a wrist-pin as when in service.

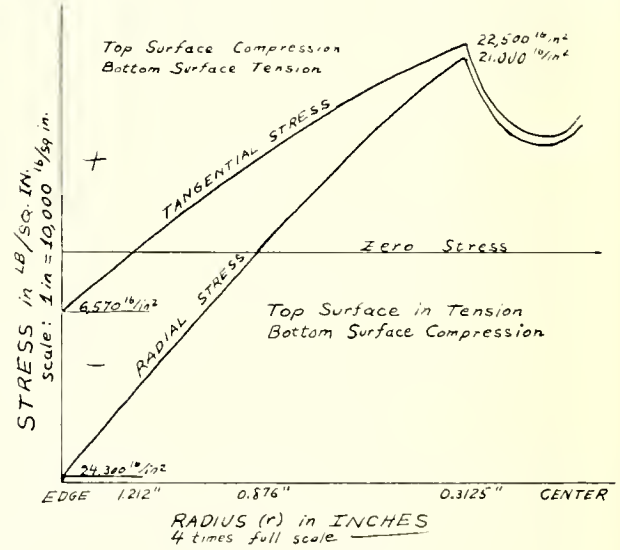
The test device which was finally designed consists in principle of a pipe of inside diameter equal to the outside diameter of the piston and having a hole drilled through the sidewalls to support the wrist-pin. The piston is supported in the pipe by a solid steel wrist-pin, sand is added to a depth of over an inch on top of the piston, and pressure is then applied to this sand (see Fig. 5.

6. *Test Results.* Three pistons were tested to failure in the test apparatus. The failures of two pistons that had been in use for 34,000 miles are shown in Figs. 2 and 3.

Piston No. 4 failed when the unit pressure over the top of the piston reached 2080 lb. per sq. in. One crack extended completely around the knob on the lower surface of the piston top. Another crack in the upper surface extended almost all the way around the top and about 1/4 in. in from the edge. These two cracks were connected by three radial cracks.

Piston No. 2 failed when the unit pressure reached 1750 lb. per sq. in. The failure was similar to that of piston No. 4 but more pronounced. The crack around the knob went almost all the way through to the upper surface so that a slight tap was sufficient to remove it (see Fig. 3). Examination of the fracture around the knob indicated that a fatigue crack had existed before the piston was placed in the testing machine, as less than half of the fracture was bright, the remainder being blackened with carbon. All other fractures were bright.

7. *Discussions of Test Results.* The results of tests on the pistons show, of course, that static pressures far greater than 400 lb. per sq. in. were necessary to cause failure. The difference is due to such factors as fatigue, thermal stresses due to the temperature gradient in the piston top, internal stresses due to heat treatment, unusually high pressure due to detonation, and the effect of



CURVES SHOWING VARIATION OF STRESS IN TOP OF PISTON

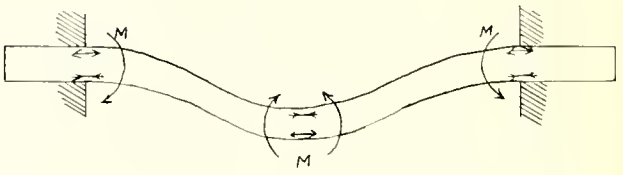


DIAGRAM ILLUSTRATING OPPOSITE MOMENTS AND STRESSES AT EDGE AND CENTER OF PISTON TOP

FIGURE 4

stress concentrators—all of which must be considered in this problem.

8. *Fatigue.* Fatigue must very decidedly have

contributed to the failure of the pistons in service. Careful study of the problem led to the conclusion that each of the six pistons originally installed in the engine had been through at least 60,000,000 stress cycles. However, in each of these cycles the stress was not completely reversed, but varied from zero to a maximum. Also the estimated maximum normal operating pressure of 400 lb. per sq. in. was not attained except when the engine was operating at somewhere near its maximum output. Therefore it was found impossible to get even an approximate idea of the number of cycles causing stress above the endurance limit.

9. *Detonation.* It is a fact well known to the motoring public that in the period in which the engine under consideration was produced, compression ratios seemed to be a few jumps ahead of the anti-knock quality of motor fuels. Also, it has been shown that detonation can produce pressures in an engine sufficient to crack piston tops in a few minutes.

10. *Other Factors.* Investigation and calculation showed the effects of high temperature, temperature gradient, and internal stresses on the strength of the piston tops were negligible.

11. *General Conclusions.* The results show that the ribs and larger fillets of the replacement pistons made the tops stronger, as failure occurred principally in the sidewalls and at higher pressures than for the old pistons. However, the value of the rib is doubtful, as it provides a section of high concentration of tensile stress near the center of the top. The only indication of failure of the tops of the two new pistons tested was a crack across the bottom of each rib near the center of the top. Such a crack would cause rapid failure in a piston subjected to the repeated stress of actual engine operation.

Test failures of the old pistons occurred in sections of the tops shown by the calculations to be subjected to the highest tensile stresses.

The results of tests made in this investigation indicate that the pistons with which the engine was originally supplied were capable of withstanding static pressures about five times as large as the normal maximum operating pressure, and that the replacement pistons were even stronger. However, the edge of the "knob" caused concentration of tensile stress in one of the weakest sections of the piston top to such an extent that the stress exceeded the endurance limit of the material.

The best evidence of fatigue failure was found in piston No. 2 (see Fig. 3). Evidently a crack existed all around the knob and more than half way through the top when the piston was removed from the engine, and there were no other

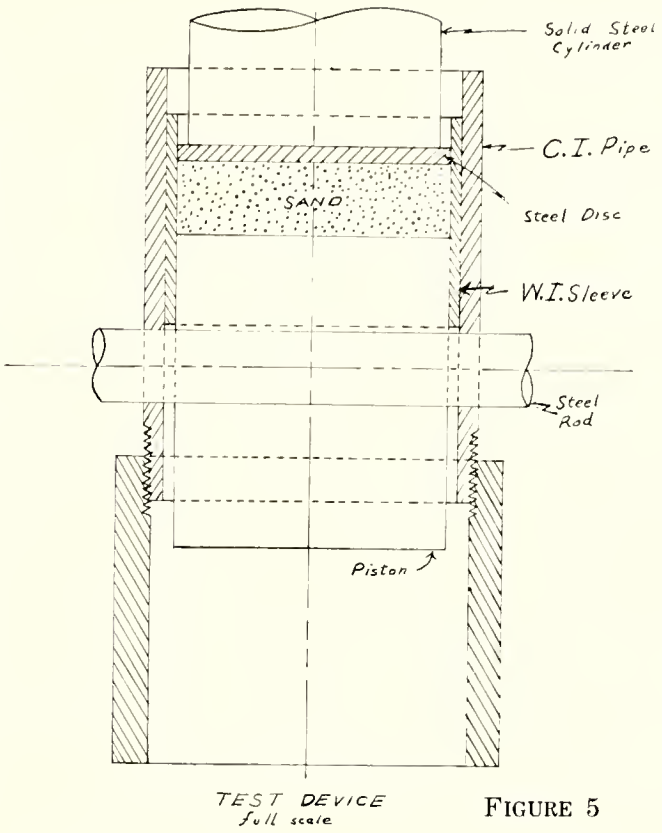


FIGURE 5

cracks in the piston. While this crack had little effect in causing failure in the testing machine, it would have resulted in rapid fatigue failure in service.

Examination of the piston which broke while in use indicated that failure most likely started from a crack at the base of the knob. There were no indications in any of the pistons that fatigue failure started in the ring grooves.

12. *Summary of Conclusions.* The results of this investigation should be regarded as applying to the solution of a particular problem, and not as comprehensive data applying to a study of pistons in general.

The conclusions resulting from this investigation are summarized as follows:

(1) Although the rib beneath the top of each new piston gives added resistance to static pressure, it is probable that the high concentration of tensile stress in the rib results in quicker fatigue failure than would occur in pistons not supplied with ribs.

(2) The failure of the pistons in service was due to concentration of tensile stress around the base of the knob of material beneath the center of the piston top to such an extent that the stress exceeded the endurance limit of the material and caused the formation of a fatigue crack.

(3) There is a possibility that unusually high pressures due to detonation were a contributory factor in causing failure as outlined in conclusion 2.

SKETCHES OF THE ENGINEER

A short sketch of each of the members of the faculty has been prepared and presented here in very brief form. Each biography is of necessity very brief, more in the order of an account in Who's Who. Although professors in the department of chemistry, physics, commerce, and English play an important part in the training of the engineering students, lack of space has prevented their inclusion in this article.

Herman Glenn Baity, Sc.D., Professor of Sanitary and Municipal Engineering and Dean of the School of Engineering. A.B., 1917, S.B. in C.E., 1922 (North Carolina); M.S., 1925, Sc.D., 1928 (Harvard), studied at Sorbonne, Paris in 1919. Dr. Baity was Superintendent of schools, Ronda, N. C., 1919-20; instructor of mathematics, U. of N. C., 1920-22; assistant sanitary engineer, N. C. State Board of Health, 1926-31, associate professor of sanitary and municipal engineering, U. of N. C., 1926-29; professor since 1929, also head of the department of civil engineering since 1928; dean of the engineering school since 1931; designer of the sewage treatment works, Chapel Hill; Chairman of the Commission on Industrial and Agricultural Research, N. C. Ten Year Plan; Chairman, N. C. State Board of Examiners for Plumbing and Heating Contractors; member, N. C. State Board of Health. Dr. Baity served as 2nd and 1st lieutenant in the Ordinance Corps, U.S.A., 1917-19. He is a member of American Society of Civil Engineers, American Public Health. Dr. Baity served as 2nd and 1st lieutenant in (sec-treas. N. C. section); Federation of Sewage Works Association, Society for Promotion of Engineering Education, Association of Managers of Sewage Disposal Works (British), Sigma Xi, Phi Beta Kappa, Tau Beta Pi. Dr. Baity is at present, state engineer examiner for the Federal Emergency Relief Administration. He has been granted leave of absence by the University to enable him to take over this work.

Thomas Felix Hickerson, A.M., Professor of Structural Engineering and head of the department of civil engineering. A.B., 1904, A.M., 1907 (North Carolina); S.B., 1909 (Massachusetts Institute of Technology). Studied at Columbia University in the summer of 1911. After leaving Columbia, Professor Hickerson was employed by the North Carolina Geological and Economic Survey for a period of two years. He served as a member of the N. C. State Highway Commission from 1915 to 1919. He was in charge of parties locating some of the trunk highways in the State, including the highways extending from Chapel Hill towards Pittsboro, from Shelby to Cleveland Springs, and from Mt. Airy to Dobson and Westfield. Later, he was city engineer of Chapel Hill in the layout of sewer systems and in the preparation of a town map. The major part of Professor Hickerson's career has been devoted to teaching, research, and writing. The textbooks which he has written are: *Highway Curves and Earthwork*, *Elements of the Strength of Materials*, and *Structural Frameworks*. He is a member of Tau Beta Pi, Sigma Xi, and American Society of Civil Engineers.

John Emery Lear, E.E., Professor of Electric Engineering. B.S. in E.E., 1901 (Virginia Polytechnic Institute); E. E., 1909 (Texas Agricultural and Mechanical College). Professor Lear has also studied at Cornell University and at the University of Wisconsin. He was employed by the General Electric Co. at Schenectady for a three-year period after leaving Cornell and again during the World War. For two years he taught physics at Norwich University. After the war when the army student training corps was begun, he came to the University of North Carolina. Professor Lear has been secretary-treasurer of the New England Section of the A.I.E.E., and Chairman of the North Carolina section of the A.I.E.E., vice-chairman of the State Board of Registration for Engineers and Land Surveyors, a member of Tau Beta Pi and Sigma Xi.

William Jasper Miller, E.E., S.M.E.E., Professor of Electrical Engineering and Acting Dean of the Engineering School, E. E., 1915 (Texas); S.M.E.E., 1922 (Massachusetts Institute of Technology). Mr. Miller became instructor in electrical engineering at the University of Texas after his graduation, and was later promoted to adjunct professor. He became an instructor at M.I.T. in 1920. Professor Miller was dean of the engineering school and head of the department of electrical engineering at Texas Technological College before coming here to head the department of electrical engineering in 1932. In addition to his duties as head of the electrical department, he is now acting as dean of the engineering school in the absence of Dr. Baity. He is a member of the A.I.E.E., a member of the Society for the Promotion of Engineering and Education, a member of the National Electric Light Association, and a Member of Tau Beta Pi.

Elmer George Hoefer, M.E., Professor of Mechanical Engineering and Head of the Department of Mechanical Engineering. B.S. in M.E., 1905, M.E., 1915 (Wisconsin). Professor Hoefer's teaching experience includes one year as instructor of mechanical engineering at the University of Iowa, one year as assistant professor of steam and gas engineering at the University of Wisconsin, thirteen years as head of the department of mechanical engineering at the University of Wyoming, and seven years as head of the department of mechanical engineering at the University of North Carolina. He was for two years assistant to D. C. and Wm. B. Jackson, Consulting Engineers, and he served in the capacity of consulting and supervising engineer on a new power plant and concrete tunnel distribution system while he was at the University of Wyoming. He also served on the board of directors of the Organization for Industrial Preparedness, and on the Naval Consulting Board of the United States. He is a member of the A.I.M.E. and of Tau Beta Pi.

George Wallace Smith, M.S.E., Associate Professor of Engineering. S.B. in E.E., 1916 (North Carolina); M.S.E. in C.E., 1932 (Michigan). Professor Smith became assistant electrical engineer at the Wilmington shipyards after his graduation from the University in 1916. Later, he returned to the University to become instructor in engineering and has since advanced to associate professor. In addition to his teaching, he has done work on the stream flows in North Carolina with the Department of Conservation and Development. He is a member of Tau Beta Pi.

Ralph McCoy Trimble, C.E., S.M., Associate Professor of Engineering. C.E., 1921 (Virginia); S.M., 1927 (North Carolina). After his graduation at Virginia, Mr. Trimble became assistant county engineer of Augusta County, Va. and later junior engineer with the Bureau of Public Roads

ACULTY AT THE UNIVERSITY

of Virginia. He taught one year at Sheffield Scientific School of Yale University. After receiving his S.M. degree here in 1927, he became assistant professor of civil engineering, and in 1929 was promoted to associate professor of civil engineering. Among his activities in North Carolina, Mr. Trimble headed a survey of the water power in Ashe and Watauga Counties and a survey for making maps for soil erosion studies of the North Carolina coast. For the past several summers, he has conducted the summer camp for the junior civil engineers at Brevard, N. C. He is a member of Tau Beta Pi.

Neil Phillips Bailey, M.E., Associate Professor of Mechanical Engineering. B.S. in M.E., 1924 (Colorado); M.S. in M.E., 1927 (Idaho). Mr. Bailey is leaving the University next year to become head of the department of Mechanical Engineering at the University of Idaho. An article describing an interview with him will be found elsewhere in the magazine.

Alfred McLaren White, Sc.D., Associate Professor of Chemical Engineering and head of the department of chemical engineering. B.S.E., 1925 (Michigan); M.S., 1926 (California); Sc.D., 1928 (Michigan). Dr. White was employed during successive summers while in the graduate school at Michigan by the Goodrich Rubber Co., the National Aniline Co., and the Parke Davis Co. Upon completion of his work at the University of Michigan, he went to Georgia Institute of Technology and served as head of the department of chemical engineering for two years. He has been head of the department of chemical engineering here at the University since 1930. Dr. White is a member of Tau Beta Pi, Sigma Xi, Iota Alpha, American Institute of Chemical Engineers, the Elisha Mitchell Scientific Society, and the American Chemical Society. He is Chairman of the Committee of Student Chapters of the A.I.Ch.E., and a member of the State Motor Vehicle and Inspection Board. His hobbies are music and painting. His "Symphony No. I" was played by the University Symphony Orchestra on Sunday, April 29.

Gail Phillips Edwards, Ph.D., Acting-Associate Professor of Sanitary Engineering. B.S., 1918, M.S., 1921, Ph.D., 1923 (Illinois); M.S. in Engineering, 1933 (Harvard). After leaving Illinois, Dr. Edwards was employed by the Illinois State Water Survey for four years. Then he accepted a position with the Sanitary District of Chicago, and conducted research there for nine years. He entered school again at Harvard in 1932, and obtained his degree in engineering. He came to the University in the fall of 1933 and has since been teaching sanitary engineering in the department of civil engineering.

Arthur Russell Hollett, S.M. in C.E., Instructor in Engineering. S.B. in C.E., 1928, S.M. in C.E., 1933 (North Carolina). Mr. Hollett's professional experience includes work for Westinghouse Electric and Manufacturing Co., Chalfont Engineering and Construction Co., North Carolina Department of Conservation and Development, The City of Charlotte. He has been city engineer and superintendent of sewage treatment for the Town of Chapel Hill since 1931. He is the designer of the new Chapel Hill sewage treatment plant. In addition to his other activities, Mr. Hollett has been assistant to the dean of the engineering school since 1931. He is a member of Sigma Xi.

Raymond Franklin Stainback, S.B. in E.E., Instructor in Electrical Engineering. S.B. in E.E., 1926 (North Carolina). Mr. Stainback's professional experience includes work for Carolina Power and Light Co., and the General Electric Co. at Pittsfield, Lynn, Mass., and Schenectady. In addition to his teaching in the school of engineering, Mr. Stainback is conducting private research on model transmission lines. He is in charge of the school radio station and also the standards laboratory.

Edwin Weems Winkler, B.S. in E.E., Instructor in Electrical Engineering. B.S. in E.E., 1928 (Montana State College). After his graduation Mr. Winkler was employed by the Westinghouse Electric and Manufacturing Co. at Pittsburgh, Pa. He came to the University of North Carolina in 1929 and has since been teaching in the department of electrical engineering. He is a member of Tau Beta Pi.

John Dargon Watson, Instructor in Civil Engineering. A.B., 1925 (Furman); S.B. in C.E. 1928, S.M. in C.E., 1932 (University of North Carolina). After his graduation in 1928, Mr. Watson became instructor in the engineering school, and at the same time continued his studies in the graduate school. He was recently appointed a member of the Committee on Statistical Methods for the Hydrology Section of the American Geophysical Union. The work of this committee will consist of a study of various methods for investigating hydrological data in an attempt to weed out inaccuracies in the great mass of existing data.

Thomas Pasteur Noe, Instructor in Civil Engineering. A.B., 1926 (University of the South); S.B. in C.E., 1928, S.M. in C.E., 1930 (University of North Carolina). After completing his work at the University, Mr. Noe was employed by the American Bridge Co. in Pittsburgh and Trenton and later by Robinson and Steinman, consulting engineers of New York City. He returned to the University in 1931 to become instructor in the department of civil engineering. He is a member of Tau Beta Pi, Phi Beta Kappa, Sigma Xi, Elisha Mitchell Scientific Society, and the American Society of Civil Engineers.

Colin Carmichael, B.Sc., Instructor in Mechanical Engineering. B.Sc., 1926 (University of Glasglow). After his graduation from the University of Glasgow, Mr. Carmichael became engaged in the designing of steam engines, turbines, and Diesel engines for ship-building companies in Great Britain, Northern Ireland, and the United States. Later he became junior engineer on the S. Mauretania of the Cunard Line. In 1931, he came to the University of North Carolina as instructor in mechanical engineering, specializing in the courses of Internal Combustion Engines, Steam and Gas Machinery, Mechanism, and Machine Design.

Charles Edward Feltner, B.S. in C.E., Instructor in Engineering. B.S. in C.E., 1928 (Virginia Polytechnic Institute). Mr. Feltner came to the University of North Carolina in 1928 as instructor in engineering. In 1929 he left the University to become associated with the Curtis Airplane Co. of New York City. Later he was employed by the Stearman Airplane Co., Wichita, Kan. and by the Philips Petroleum Co., Tulsa, Okla., as consulting and construction engineer. He returned to the University in 1931 as instructor in engineering.

Neil P. Bailey Goes to Iowa State

By EDWIN A. GASKILL

The Engineering School is very unfortunate in loosing the services of Professor Neil P. Bailey who has accepted the position of head of mechanical engineering at Iowa State College. Professor Bailey will succeed Professor W. H. Meeker (Cornell, 1891) who is retiring, and will be the youngest department head ever appointed by the school which is indeed an honor.

NEIL P. BAILEY

Professor Bailey was born in Canon City, Colorado in 1901, and was raised in the gold mining and cattle section of western Colorado. In 1918 and 1919 he served with the United States Marine Corps on Asiatic duty. Following his service with the marines he attended the University of Colorado, where he received a B.S. degree in Mechanical Engineering in 1924. After studying an advanced engineering course under the chief engineer of the General Electric Company, he took graduate work at the University of Idaho, which awarded him a master's degree in Mechanical Engineering in 1927.

The major portion of Mr. Bailey's industrial career has been spent with the General Electric Company in Schenectady and with the Washington Water Power Company in Spokane, Washington. Of his nine years' teaching experience he has gained four at the University of Idaho and five at the University of North Carolina.

Besides his activities in industry and education Mr. Bailey has accomplished much in several fields of research, particularly in studies of heat flow, temperature measurement and air flow. His most significant works are summed up in the following papers which he has published: Heat Transfer from Metal Fins, *General Electric Company Report* (1925; Heat Flow from Underground Electric Cables, *Transactions of the American Institute of Electrical Engineers*, (1929); The Response of Thermocouples, *Mechanical Engineering*, (1931); and The Measurement of Surface Temperatures, *Mechanical Engineering*, (1932). His work on thermocouples comprised an investigation of the errors caused by large temperature gradients at seady temperatures and by varying temperatures. His studies of surface temperature measurements involve the effect of the thickness of thermometer coverings, of thermometer types, of covering materials used, of surface position, and of the construction of thermocouples on the accuracy of the temperature readings. He is now completing research in pulsating air flow, the type of air flow pertaining to air blowers, airplane propellors, and internal combustion engine air intakes.

As a result of this work he has devised an instrument for the measurement of such air currents and has applied for a patent to cover his invention. Heretofore the only instruments available for such measurements were designed for continuous air flow; consequently they were in error as much as twenty per cent.

Professor Bailey is a member of a number of organizations as follows: Tau Beta Pi; Sigma Xi; Sigma Tau, an honorary undergraduate engineering fraternity; The American Society of Mechanical Engineers; and the Society for the Promotion of Engineering Education. He is also a member of Acacia, a social order.

Mr. Bailey's appointment to take charge of mechanical engineering at Iowa State College is an honor which he has merited by his services here and at other institutions. He has obtained a high position at an early age. It will be very difficult for our engineering school to find another man as capable as Professor Bailey and he will be greatly missed.

The University's Summer Surveying Camp

By Paul L. Onasch

Each summer the University of North Carolina conducts a surveying camp in the mountains of western North Carolina. The camp is primarily for student civil engineers who have successfully completed two years of study, and provides a course in the theoretical and practical applications of surveying. The course which formerly lasted for six weeks, has now been lengthened to two months, starting around the second week in June and lasting until the first week in August.

The camp has with the exception of one year, when it was located at Camp Mondamin, Hendersonville, N. C., been established at Camp Sapphire, a boys' camp. Camp Sapphire lies about two miles northwest of Brevard, N. C., in the heart of the Blue Ridge Mountain Range.

The course is divided into theoretical study which is explained by the instructor's lectures and practical work which is actually performed by the students in the field. In addition to these divisions the subject of surveying is further subdivided under numerous other heads which are chaining; differential, profile, and cross-section leveling; plane table, transit, and stadia topographic surveys; solar and stellar observations for the determination of meridian and latitude; triangulation including base line measurement; stream discharge measurement; hydrographic surveying; simple compound, reversed, spiral, and vertical curves; frogs and turnouts; reconnaissance surveying; preliminary surveys; paper locations; final locations; mass diagram and earthwork computations; slope-staking; quantities and

Class Outdoors

cost estimates; topographical drawing; and the mapping of traverse and boundary surveys.

The engineering school through its large assortment of equipment is able to supply each student suitably with the instruments and apparatus he would need for performing the field work of the varoius divisions of surveying. The high cost of the instruments and materials, however, necessitates the employment of extreme caution by each engineer who uses this equipment.

After the practical applications of the theoretical work has been explained to the engineers, they are usually separated into field parties. The separation is determined mostly by the number of men needed in each party for a successful survey.

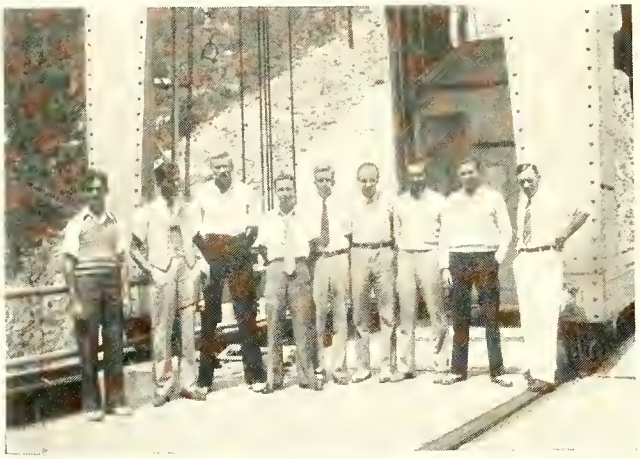
Stream Gauging

Quizes are given every two weeks as a check for the student in seeing how well he has grasped the subject. Field note-books containing all the data of the work completed by the students in the field are required of each man to train him for possible work of a similar nature in the future.

One of the most interesting and instructive features of the course is the inspection trips which the engineers take. These trips are included in the summer session mainly to acquaint the students with actual engineering projects and accomplishments, giving them an idea of what actual engineering work is like. For example, the engineering class of 1935 during the summer of 1933, through the courtesy of Mr. J. E. S. Thorpe, president of the Nantahala Power Co., were able to visit the Santeetlah Dam and Power Plant, the Tapoco Dam and Power Plant, both located in the western part of North Carolina, and the Calderwood Dam and Power Plant in Tennessee. This trip, the longest of its kind ever attempted, was considered the most educational and interesting of any undertaken by preceding classes. Through the kind assistance of the employees at the dams and the plants, numerous valuable facts on the methods of operation, the costs,

and the efficiencies of these developments were pointed out and explained.

Then, too, there are the regular trips which have to be taken to complete the work required in the course. One of these trips is a visit to a nearby river, usually the "French Broad," where



STUDENTS VISITING CALDERWOOD DAM

an exercise in stream gauging is studied and performed. An investigation of the land deeds in the courthouse of Brevard for study and reference work constitutes the other trip.

Other important and interesting highlights of the camp terms are the visits and the talks made by prominent engineers. Well-known engineers willingly sacrifice some of their valuable time in cooperating with the instructor by explaining the purpose of past, present, and possible future developments in the field of engineering. They generally bring charts or illustrations of their work so as to clarify parts of their talks which cannot be readily and easily explained by speech.

During the summer of 1933 a valuable addition

EVAPORATIVE PAN

was made to the camp through the unselfish and untiring efforts of Professor R. M. Trimble and the class of 1935 which so capably assisted him. This addition was the establishment of a weather bureau station. This station was of the standard evaporation pan type and consisted of a tin circular-shaped evaporation pan, a rain gauge, and a "roost" in which the barometer and thermometers were kept.

The total cost of the camp session for each engineer has been very reasonable in the past, the amount being relatively small when compared to the valuable experience and education obtained. Another consideration which is of the prime importance is the noted improvement in health which is usually evidenced among the engineers after the camp term is over. Estimating the exact cost is very difficult because of the fluctuations in the prices of food, equipment, and tuition each session. A reasonable figure would be one-hundred and fifty dollars for out-of-state students and approximately twenty dollars less for in-state students. These estimates, however, only include the amount of money needed for necessities and not the quantity which would probably be expended for personal pleasures.

At the present time there are possibilities of having students perform triangulation work for the state of North Carolina in establishing bench marks at two mile intervals in the county of Transylvania. Definite plans have not been formulated as yet, though, and may be subsequently discarded if the sponsors of the idea think it would prove unsuccessful.

Since the summer surveying course has proven so successful in the past few years and since possible valuable improvements ars being contemplated for future camp sessions, the University should feel proud that this course is now required in the civil engineering curriculum.

MAPPING WITH PLANE TABLE

Chemical Engineers' Day

By Edwin A. Gaskill

Dr. Curtis Opens the Program

The second annual Chemical Engineer's Day, sponsored by the local student chapter of the American Institute of Chemical Engineers, opened in Venable Hall at nine-thirty o'clock on April thirtieth with an address by Dr. Harry A. Curtis on "Coal as Viewed by Modern Science."

Dr. Curtis, who was introduced by President Bruce Old, is one of America's foremost chemical engineers. His experience as a professor at Yale, Northwestern, and the University of Colorado, and his connections with various government and industrial, enterprises have made him an authority on engineering education, fuels, and nitrogen fixation. At present he occupies the important position of Chief Chemical Engineer of the Tennessee Valley Authority.

In his interesting lecture Dr. Curtis discussed the constitution of coal under which topic he explained the British terminology of Stopes and the American terminology of Thiessen, the structure of each physical constituent, and the origin of coal. He stated that very little of the reactions in peat bogs had been done and that much concerning the origin of coal probably could be found from such study. He turned next to the classification of coal and then concluded his lecture by listing the products given off during the carbonization process and by describing the properties of a god coking coal.

Mr. Perry Speaks on Cellophane

Mr. William Perry of the R. J. Reynolds Tobacco Company was introduced by John Pittman at eleven o'clock. Mr. Perry attended the engineering school here from which he graduated in 1930. Following his graduation he spent two years with the E. I. du Pont de Nemours Co., doing work on cellophane. He then obtained his present position with R. J. Reynolds Tobacco Co.

Mr. Perry lectured on the composition of cellophane, the many processes involved in its manufacture, and its uses.

Water Softening for Railroads Explained

The series of talks was reopened at three o'clock by Mr. R. C. Bardwell, who was introduced by Albert New. Mr. Bardwell attended the University of Illinois where he became a member of the track team, glee club, and Phi Lambda Upsilon fraternity. He now occupies the position of Superintendent of Water-Supply, Chesapeake and Ohio Railway System, Richmond, Va.

Of al the materials used by railroads Mr. Bardwell said that water was the most extensively used; consequently more could be saved by testing and treating water than any other material. He continued his lecture with particulars concerning the two kinds of troublous mineral matter occuring in water, and the processes and apparatus used to remove them. He illustrated his lecture with specimens showing boiler scale and the effect of corrosive minerals on rivets and tubes.

Surface Reactions Professor Taylor's Topic

At four o'clock a seminar on "Recent Developments in the Study of Reactions at Surfaces" was conducted by Professor Hugh S. Taylor under the auspices of the North Carolina Chapter of the Society of Sigma Xi.

Professor Taylor is an Englishman by birth, but he has lived in America since the war. During the war he worked for the British Government on munitions. When the war was over he accepted the chairmanship of the Chemistry Department at Princeton which is the position he now occupies.

Professor Taylor explained how the new theory of non-uniform surface activity clears up a number of doubts concerning surface catalysis.

Banquet Held

A banquet at Graham Memorial was event number five on the day's program. Professor Taylor delivered an after dinner talk on the destruction of natural beauty by industry and expressed the hope that future industrial development would spare the destruction of nature. Dr. Cameron concluded the festivities with an amusing anecdote concerning an experience of his in France. When Dr. Cameron finished speaking, the diners went to Gerrard Hall

Program and Purpose of T. V. A. Presented

Dr. Curtis was introduced to his evening audience by Dr. White. The Tennessee Valley Authority is, according to Dr. Curtis, the result of several influences; namely, Senator Norris' agitation for public ownership of public utilities and the desire of the administration to attempt the solution of several social and economic problems. The reforestation of abandoned agricultural lands, renewal of soil fertility with cheap chemical fertilizer, flood control, modernization of farm homes with cheap electricity and electrical appliances, and the union of agricultural and industrial enterprise in the lives of the inhabitants of the valley are the many objects sought by the government. To obtain these objects a vast system of dams, power plants, towns, and trade schools is being set-up; and the big fertilizer plant at Muscle Shoals is being operated.

Among Our Alumni

By W. H. McNAIRY

In looking over the records of the graduates of the School of Engineering, one finds them everywhere, in South America, in Porto Rico, in Russia, and scattered throughout this country. Some are not strictly engaged in engineering work, but have found new types of work which can be done better by men with engineering training. Although the school is young, many of its graduates hold important positions in the engineering world.

The following list of graduates, although not complete, shows the typical work in which our engineering graduates are engaged at the present time:

J. V. Lewis, '91, was in charge of arrangements for a section for the World Fair. He took part in making the North Carolina geological survey in 1891-'96, and then worked on the New Jersey Geological party. He worked as a mining and petroleum geologist in Mexico, Alaska, Canada, and United States. Formerly he was a professor at Rutgers, and has written several technical books and articles about mining.

A. H. Patterson, '91, was once president of the Elisha Mitchell Scientific Society. He started out as an instructor in the University of Georgia and was later a professor there. Leaving Georgia he came to U.N.C. as a professor, and finally became dean of the School of Applied Science.

F. F. Bahnson, '96, is president of the Bahnson Co., manufacturers of air humidifiers. He has done a considerable amount of research work in air conditioning and has developed and now manufactures the Bahnson Humidifier.

John S. Henderson, '02, who is now general sales manager of Westinghouse Mfg. Co., started his career as an apprentice in the testing department of Westinghouse.

H. McRary Jones, '05, deceased, went with the Western Electric Manufacturing Co., upon his graduation here. He was chief electrical engineer for the Southern Porto Rico Sugar Co. Afterwards, he was in charge of electrification of Chilean State railways at Santiago, Chile. His last job was that of general manager of the International Power Co. and vice-president of the Montreal Engineering Co.

F. M. Weller, '06, is superintendent of industrial power for the Consolidated Gas, Electric Light & Power, of Baltimore, Md. He was once temporary professor of electrical engineering here.

R. T. Brown, '11, is an associate professor of Civil Engineering at the University of Tennessee. He was once general superintendent and treasurer of J. T. Platt Co., contractor, and is author of numerous on road and bridge construction.

T. M. Price, '12, started his work with the Raleigh Granite Co., and was later superintendent and engineer of Kaiser Paving Co., Seattle, Wash. He is now superintendent of materials, production and railways of Hoover Dam.

Robert Lassiter, '05, is president of the Lassiter Construction Co. It is one of the largest road building companies in North Carolina.

H. G. Baity, '22, is now State Engineer for the Federal Emergency Public Works Program. Upon his graduation from here, he became an instructor in engineering, and in 1928 he became dean of the School of Engineering.

P. D. Carter, '26, is an engineer in Russia as an expert in telephone and telegraph line construction.

C. T. Smith, '27, is an engineer with the A. T. & T. in New York City.

A. R. Wright, '27, is a designing engineer for the Nashville Bridge Co.

R. G. Ambrose, '28, is the engineer in charge of refrigerators for the General Electric.

J. J. Slade, '29, is an assistant professor of engineering at Rutgers University, New Brunswick, N. J.

W. E. Bobbitt, '30, is in the department of Maintenance for the Virginia Electric and Power Co.

J. P. Scurlock, '30, is an assistant engineer for the Pennsylvania Bell Telephone Co.

J. B. Pittana, '30, is in engineering work in Italy.

H. F. Chrisco, '31, is with the Aluminum Company of America.

R. J. Ruble, '31, is an assistant engineer in the research laboratories for the Texas Co.

Thomas Riddick, '31, is an instructor of Sanitary Engineering at N. Y. U.

John Andrews, '32, is an engineer with the State Board of Health.

R. C. Cadmus, '32, is with the Bethlehem Steel Corporation.

F. M. Laxton, '33, is with Tucker and Laxton Co., General Contractors, Charlotte, N. C.

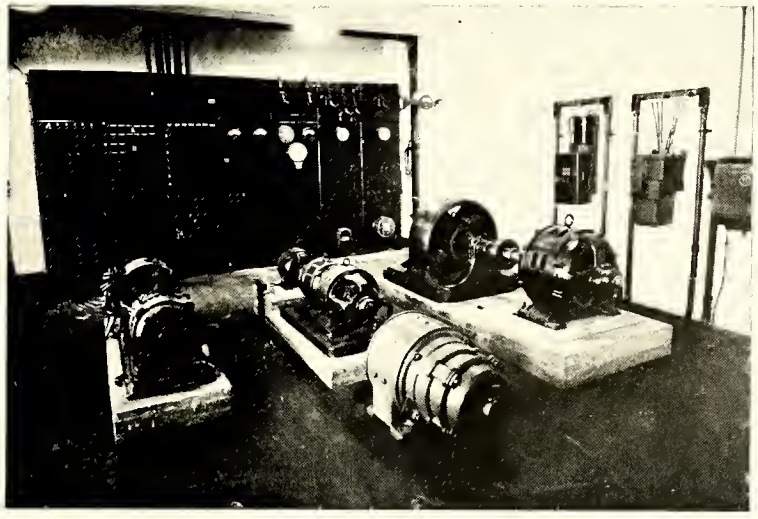
F. C. Cain, '33, is an engineer with the Louisiana State Highway Commission.

John Hunter, '33, is working with the Tennessee Valley Authority.

F. S. Black, '33, is connected with the Nantahala Power and Light Co., Bryson City, N. C.

W. G. Miller, '33, is with the Westinghouse Electric and Mfg. Co., East Pittsburgh, Penn.

PHILLIPS HALL



D. C. Power Supply
in
Electrical Laboratory

Wind Tunnel
in
Mechanical Laboratory

Electrical Laboratory
below

Uniflow Engine
in
Mechanical Laboratory

History of Radio Station W4WE

By ROBERT VAN SLEEN

In 1918 a group of students and faculty members interested in radio erected a radio station in Chapel Hill. For several years, on their own initiative, they operated this station, and then in 1921 it was taken over by the electrical engineering department of the University. The station, located in Phillips Hall, was licensed by the Government under the call letters of NU4WE. William F. Alston was probably the first operator.

In 1925 the MacMillan Arctic Expedition was contacted a number of times and many messages were exchanged. After the expedition returned in 1926, a letter arrived from them naming this station as one of the 15 stations doing the best work in the interests of the expedition.

A type UV202 tube was put in operation in 1926 with about 45 watts power input. In the same year, the station received an appointment as an Official Relay Station of the American Radio Relay League.

In 1928 a Hartley oscillator was built for use of the 20 meter amateur band, but it was soon abandoned in favor of a crystal-controlled transmitter. The station was now called W4WE, the prefix being changed for all amateurs in the United States by international agreement.

The ship *Eleanor Boling* of the Byrd Antarctic Expedition was communicated with in 1928 when it was about 300 miles southeast of New Zealand. Later the expedition was contacted after it had landed at the Bay of Whales, Ross Sea, Antarctica. A letter was received from this expedition also, commending the operators on the excellent services they had performed.

In 1930, W4WE received recognition of having successfully carried on two-way communication with all continents. For this work, the station was presented a WAC certificate from the American Radio Relay League.

Amateur radio-telephone work was begun some years ago, and at the present the radio station has a telephone transmitter in operation on the 75 meter phone band. Two UV 303-A's are used in the final amplifier stage, giving a fine quality of transmission.

The radio-telegraph or CW transmitter is crystal-controlled and employs a single UX852 in the final stage. Also in use is a tuned radio frequency receiver composed of a '58 r.f. stage, a '58 detector, and a '56 audio stage.

The station is now operated only by students. The present staff of operators includes Frazier, Ridenhour, Koch, Jennings, Zinc, Rockwell, and Van Sleen, under the supervision of C. F. Stainback. W4WE has communicated with every country from South Africa to Alaska.

AN INTERVIEW WITH DR. CURTIS

(*Continued from page four*)

technical courses and the so-called cultural courses. Courses which teach the fundamental principles of engineering should not be dropped on any account to make room for cultural courses."

During his career, Dr. Curtis has on many occasions interviewed students who were seeking jobs. His advice to the young man who is about to be interviewed for the first time is: "Don't lose your head." It is very important that the young man feel at ease so that he will be able to think clearly and to express himself well. When Dr. Curtis interviews a man for a job, he pays most attention to the man's ability to develop ideas and his ability to express them. He usually gives the man a problem of a general nature, and asks him how to solve it. As the applicant unfolds his solution, Dr. Curtis asks questions about various details, and observes closely how the man grasps the essential elements of the problem and how he reasons it through to the logical solution. In his opinion, a man who replies slowly, giving thoughtful answers to questions, is much more apt to be employed than one who gives hurried answers that have not been given the proper thought.

Dr. Curtis does not attach very much importance to extra-curricula activities for engineering students. He thinks it highly desirable that students take an active interest in the engineering societies, but he does not believe that one can devote himself to many outside activities and at the same time give the proper attention to his school work. He would much prefer to employ one who has no outside activities and excellent grades to his credit than one who has many activities but ordinary grades. In his opinion, athletics add little to the credit of the applicant for a job. "I do not believe," he said, "that a man can be a football player and a good engineering student at the same time."

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